REVIEWS.

Wilman, M., Preliminary Check List of the Flowering Plants and Ferns of Griqualand West (Southern Africa). With a Farm Map by J. P. H. Acocks. Cambridge: Deighton Bell. Kimberley: Alexander McGregor Memorial Museum. 1946. pp. vii and 379. 45/- net.

There is ample evidence that the study of and indeed interest in the flora of this country is handicapped by a lack of suitable sources of information. Of the sources that exist a very large proportion deal with the subcontinent as a whole and hence are either too extensive or are too superficial in respect of any special area and do not meet the real needs. With this in mind the advent of a work on the flora of Griqualand West, a region of very great floristic and phytogeographical interest, seemed something of real importance. The hopes aroused were perhaps slightly dashed on the actual reading of this book. In the preface it is stated to be a temporary substitute for a more ambitious and complete work. It is that work that one still hopes for.

The present book is published now without the general and descriptive portions in order to fill what is stated to be a real demand. The book is a list of the plants of the divisions of Herbert, Kimberley, Barkly West and Hay, with the localities in each division for each species and references to the collections in the Museum and elsewhere. There are also some notes on habitats and frequency, and on occurrences in adjoining districts, especially Kuruman.

The arrangement followed is that adopted in the Flora Capensis. References to that work, not always correct, are given under the genera. In each genus the species are arranged alphabetically. There are included a number of species for which identification has not been possible. Following the list is a glossary of terms and abbreviations, and a list of common names with their botanical equivalents. A farm map is appended. This gives all the localities mentioned in the list, and though not very easy to read should be of real value.

A work of this kind is of most value to the phytogeographer and the specialist for whom it brings together data otherwise unobtainable. For the ordinary botanist or plant lover the absence of any descriptions or means of identification is a serious drawback and in this case one liable to be emphasised by the rather high price of the book. For these especially the full work that is promised, is a real desideratum and one hopes that its production will not be unduly delayed.

The book is well got up and the type large and readable. One wonders whether a transposition of the types used for names of families and of genera might not have made reference easier. There are a considerable number of mistakes but these seem to be errors in the manuscript and not due to the printers. When the full work appears these and some errors of nomenclature should be revised.

R. S. Adamson

M. Henrici: The Transpiration of South African Plant Associations. Part I—Transpiration of Karoo Bushes, Sc. Bull. No. 185, 1940; Part II—Indigenous and Exotic Trees under semi-arid Conditions, Sc. Bull. No. 248, in press; Part III—Indigenous and Exotic Trees in the Drakensberg Area, Sc. Bull. No. 247, in press; Part IV—Parkland; Forest and Sour Mountain Grassveld; Large Karoo Bushes, Sc. Bull., No. 244, 1946. Department of Agriculture of the Union of South Africa. Government Printer, Pretoria.

This series of bulletins presents the results of transpiration studies undertaken by Dr. M. Henrici, Ph.D., D.Sc. (Senior Professional Officer, Veld Reserve, Fauresmith, O.F.S.), in the period 1932 to 1942. Parts I and IV are available in both official languages. Part II is not on sale at present because the Afrikaans translation has not been completed. Part III is in the press, but the reviewer has had the opportunity of perusing an uncorrected proof in English.

Parts II and III and portion of part IV describe investigations conducted with the specific object of finding out whether indigenous trees in South Africa transpire less than exotic trees like species of *Eucalyptus* and *Pinus*. The general conclusion arrived at is that exotics consume more water, and that they are consequently not to be recommended for planting in stream catchment areas. The data on which such a far-reaching recommendation is based need to be subjected to an objective review.

It is doubtful whether an accurate technique for measuring the transpiration of plants in the field is available to-day, and it is even more problematic whether a satisfactory procedure for estimating the use of water by associations of plants could be made available at present. Dr. Henrici's attempts to achieve these objects are also open to serious criticisms.

Dr. Henrici's technique depends on the use of the Hartmann and Braun Torsion Balance, which is used to weigh and re-weigh cut twigs, rapidly, within a few minutes after cutting. Weinmann and le Roux

(S.A. Journal of Science, 42, pp. 147-153, 1946) have made a critical study of the Torsion Balance for measuring transpiration. They found that :—

" Agreement in the rate of water loss for three minutes before and after cutting was poor. Only in approximately ten per cent. of the experiments with barley, maize, oats and fescue, and in 35 per cent. of the experiments with wheat did the transpiration rates agree within 20 per cent. The average discrepancies ranged from 49 per cent. in maize to 106 per cent. in barley.

The correlation coefficient for the actual water loss during the three minutes before and after cutting in all (85) experiments was — 0·319."

They concluded, with complete justification : " The results indicate that in the plants investigated the determination of the water loss from the cut plants cannot be regarded as a reliable index of the true transpiration rate of the intact plant."

Data yielded by a technique which is so unsatisfactory hardly warrant the definite conclusions drawn by Dr. Henrici. There are also other serious shortcomings in Dr. Henrici's experiments which must be pointed out.

Assuming that acceptable techinque had been used, Dr. Henrici would have done much better had she restricted her field to one or two plant associations. This would at once have reduced the number of species selected for observation, and also avoided very considerable variations in climate and other site factors. The number of replications of readings for individual species could then have been greatly increased. Using some other *relatively* reliable technique, she might thus have gained relative estimates of the water used by one or two associations. Dr. Henrici has set herself a particularly hard task in attempting to estimate the absolute volume of water transpired by trees and forests, which, because of their size, provide extremely difficult material for transpiration studies. It is questionable whether even relatively accurate estimates of the water used by associations of trees could be obtained.

Dr. Henrici has dispensed with statistical design in her experiments. Consequently many of the differences estimated by her and discussed at length may be statistically quite insignificant, even if they are relatively large. She has not made use of replication and randomization in order to reduce the experimental error and form a valid estimate of it. Her data show very considerable variability because of the unreliable technique used, and because of the considerable natural variability of transpiration due to differences in meteorological and soil conditions, differences in foliage material from one plant to another, and from one twig to another, even on the same plant.

Dr. Henrici does not indicate how sampling was done for the estimation of the volume of water transpired by whole trees and associations. Evidence is available that in trees shaded twigs generally transpire less than those in the sun, and that leaves near the tops of tall trees transpire less than those nearer the ground. Has Dr. Henrici taken her twigs from all parts of the tall trees she studied ? In view of the fact that the transpiration of trees probably decreases with increased height above ground-level, her hypothesis that larger, taller, exotic trees must use more moisture than lower indigenous species cannot be accepted without further data. Her statement that faster growing exotics must use more moisture than slower growing indigenous species is also not borne out by her data, which show no difference in transpiration of exotics and indigenous species per unit weight of fresh material per unit of time. Dr. Henrici's data merely tend to show that exotics use water more efficiently.

After Dr. Henrici has concluded from her data that exotic trees (especially pines) do *not* transpire more than indigenous species (part II, page 6 ; III, page 32 ; IV, page 12) she develops the hypothesis that *plantations* of exotics use more water than natural forests. These conclusions are thus derived from theorising on unreliable data. In estimating the water use of *stands* of trees on the basis of observations on cut twigs so many factors have to be taken into account that the value of the estimates is highly problematic. Such estimates by Dr. Henrici have been quoted, without justification, as scientific facts and widely used as arguments against afforestation.

C. L. WICHT.